UK Fluids Network SRV report: Sensitivity study of the tidal circulation pattern around Orkney Islands – is there a threshold of chaos?

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The short visit was conducted from the end of April to May, 2018. Dr Wang visited Prof David Woolf at the International Centre for Island Technology, Heriot-Watt University, Orkney Campus. This visit was intended to start connections to the local research groups, who are active in marine renewable energy studies and to explore the access to existing numerical models and datasets for hydrodynamic model validation to conduct a sensitivity analysis on the tidal circulation pattern around Orkney Islands.

During the trip, Dr Wang visited the campus and held meetings with Prof Woolf's research group. Dr Wang presented his research on the existing tidal energy potential studies in the San Francisco Bay area (Figure 1), and the potential extension to the study was discussed. Prof Woolf's research group was most interested in the applied methods of model order reduction and sensitivity analysis, which have a great potential to address the site selection issue in Pentland Firth. Prof Woolf's research group showed their existing models and a model under development for the potential tidal energy site selection in Pentland Firth. Relatively, the Pentland First model is smaller in scale but includes high speed streams. In addition, it will be challenging to validate this model because nesting scheme has to be implemented to achieve a higher simulation resolution. A collaboration has been planned to use the model under development for a sensitivity study to optimise the energy production of future marine site selection in Pentland Firth.

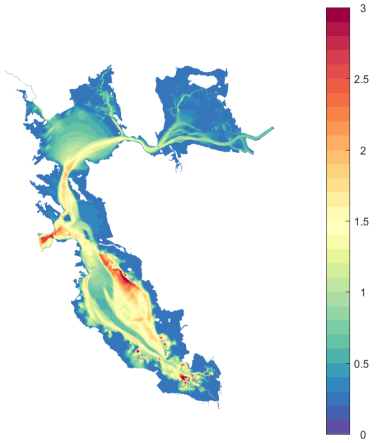

Figure 1 Tidal stream velocity distribution (m/s) in San Francisco Bay

Dr. Wang also visited the European Marine Energy Centre (EMEC), a marine energy testing and development centre, and AquaTerra, a private company in marine energy. A field trip was conducted to visit their research lab (Figure 2) and testing sites. It was a good opportunity to learn the frontier of the research and develop new research ideas.

Figure 2 Tidal energy devices: tidal turbine (left) and testing sensor platform (right)